CORRESPONDENCE/MEMORANDUM

State of Wisconsin

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TO: File

FROM: Woody Myers - WCR

SUBJECT: Village of Nelson - Land Disposal System Evaluation Report, WPDES Permit # WI-0029459

Effluent & Groundwater Evaluation Summary

Table 1 Land Disposal Effluent Parameters and Limits

Parameter	Current Permit WI-0029459-09		Proposed Permit WI-0029459-10	
	Limits and Units	Limit Type	Limits and Units	Limit Type
Flow Rate	- MGD		- MGD	
BOD_5	50 mg/l	Monthly Avg	50 mg/l	Monthly Avg
Total Suspended Solids	- mg/l		- mg/l	
pH, Field	- su		- su	
Total Dissolved Solids	- mg/l		- mg/l	
Organic Nitrogen	- mg/l		- mg/l	
Ammonia	- mg/l		- mg/l	
Kjeldahl Nitrogen	- mg/l		- mg/l	
Nitrite + Nitrate as N	- mg/l		- mg/l	
Total Nitrogen	- mg/l		- mg/l	
Chloride	- mg/l		- mg/l	

No recommended changes

Table 2 Monitoring Wells

Well	Current Permit WI-0029459-09		Proposed Permit WI-0029459-10	
	Well Location	Well Designation	Well Location	Well Designation
801 MW-1	Up-gradient	Background	Up-gradient	Background
802 MW-2	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard
803 MW-3	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard
804 PZ-1	Down-gradient	Non-Point of Standard	Down-gradient	Non-Point of Standard

No recommended changes

Table 3 Groundwater Standards

Parameter	Current Permit WI-0029459-09		Proposed WI-0029459-10	
	PAL	ES	PAL	ES
Depth to Groundwater	N/A	N/A	N/A	N/A
Groundwater Elevation	N/A	N/A	N/A	N/A
pH	4.1-6.1 su	N/A	*6.0-8.0 su	N/A
Total Dissolved Solids	550 mg/l	N/A	550 mg/l	N/A
Chloride	150 mg/l (ACL)	250 mg/l	*145 mg/l (ACL)	250 mg/l
Nitrogen, Ammonia	1.2 mg/l (ACL)	9.7 mg/l	1.2 mg/l (ACL)	9.7 mg/l
Nitrogen, Organic	2.5 mg/l	N/A	2.5 mg/l	N/A
Nitrogen, Nitrite + Nitrate	2.4 mg/l (ACL)	10.0 mg/l	2.4 mg/l (ACL)	10.0 mg/l
Phosphorus, Total	N/A	N/A	*Discontinue	

* Recommended changes from previous permit

Site Information

The Nelson Wastewater Treatment Facility a municipal facility and is located on State Highway 35, Nelson, Buffalo County. Wastewater is currently treated via stabilization ponds and discharged to groundwater via absorption ponds (seepage cells) located in the NE ¼ of the SE ¼ of Section 6, T22N, R13W, Town of Nelson.

Geology

The bedrock under this facility is the Eau Claire Formation which is comprised of a subangular poorly sorted fine-grained sandstone. Glauconite deposits are common with flaggy beds separated by green shale (*Bedrock Geology of Wisconsin, Regional Map Series West-Central Sheet*, Wisconsin Geological and Natural History Survey (WGNHS), 1988). Bedrock is anticipated to be between 100 and 150 feet below ground surface (bgs) (*Depth to Bedrock Map of Buffalo County, Wisconsin,* WGNHS, 2001). The regolith consists of medium to fine sand. Surface soil primarily consists of the Forkhorn sandy loam and the Dakota silt loam (USDA Web Soil Survey).

Hydrogeology

Calculated groundwater elevation ranges between 667 and 676 feet above mean sea level (msl). Depth to groundwater was reported to be between 5 and 20 feet bgs. Groundwater flow direction was calculated to be to the west. Regional groundwater is to the west in this area of Buffalo County (*Generalized Water-Table Elevation Map of Buffalo County, Wisconsin,* WGNHS, 2000). The site is bound on the south and west by the Mississippi River. Given the close proximity of the absorption ponds to the Mississippi River this facility is classified as a short flow path to surface water.

A review of known wells was performed as a part of this evaluation. These wells include municipal, other than municipal, private and high-capacity wells. There is one private well within a 1,500-foot range of this facility's groundwater discharge.

Hydraulic and Nitrogen Loading Rates

There are two active outfalls at this facility. Outfall 001 is the discharge associated with the groundwater monitoring network.

Table 4 Sampling Points/Outfalls

Sampling Point (Outfall) Listed in SWAMP		
Number	Outfall Type	Description
Outfall 001	Land Disposal	Effluent, sand filters
Outfall 003	Municipal Sludge	Stabilization Pond 1

The following table is the average flow (hydraulic loading), total nitrogen and chloride loading summations for the land disposal system.

Table 5 Land Disposal System Loading Averages

Year	Flow (MGD)	Nitrogen (mg/l)	Chloride (mg/l)
2021*	0.021	9.2	272
2020	0.020	7.6	204
2019	0.061	7.7	257
2018	0.046	7.6	195
2017	0.065	8.0	145
2016	0.034	7.2	174

* Indicates partial year

Groundwater Monitoring Network and Frequency

Groundwater samples were to be collected quarterly from all four wells. Well 801 is a background well and was used to calculate Preventative Action Limits (PAL) and Alternate Concentration Limits (ACL). No wells were designated and sampled as "Point of Standard Application" wells.

Table 6 Groundwater Monitoring Well Data

Sample Point	Well Name	Elevation (feet above msl)					Well Type
		Casing Top	Ground Surface	Screen Top	Screen Bottom	Screen Length	
801	MW-1	696.61	694.6	676.6	666.6	10.0	WT
802	MW-2	973.88	671.9	669.9	659.9	10.0	WT
803	MW-3	678.61	676.6	674.6	664.6	10.0	WT
804	PZ-1	672.47	670.5	658.0	655.5	2.5	P

All measurements in feet
WT-Water table Observation P-Piezometer O-Other

The groundwater samples are analyzed for the following parameters: Nitrite + Nitrate, Chloride, Ammonia, Organic Nitrogen, pH, Total Dissolved Solids (TDS) and phosphorus. All of these parameters are analyzed for the aqueous or dissolved phase in groundwater. Established groundwater quality standards are found in s. NR140. 10 Table 1 Public Health Groundwater Quality Standards, and NR140.12 Table 2 Public Welfare Groundwater Standards. The thresholds of these standards are the Enforcement Standard (ES) and the PAL.

Groundwater Conditions and Exceedances

Groundwater sampling results from this facility have been analyzed for each well to evaluate trends of regulated compounds in groundwater and to calculate PALs and ACLs where appropriate. The groundwater was evaluated by looking at approximately five years of monitoring results. PALs and ACLs are calculated from this time range.

All of the exceedances of ch. NR 140 Wis. Adm. Code Groundwater Quality Standards were observed in non- point of standards application wells, this means while they exceeded the PALs the exceedances are not considered violations because the wells are within the Design Management Zone (DMZ).

Nitrite + nitrate in well 802 had frequent PAL exceedances during the previous permit term. The trend was evaluated to aid in optimization of the facility's treatment. The concentration data was graphed, and a "best-fit" trend was established. The slope of the slope intercept equation is shallow but negative. This indicates the trend is slowly decreasing over time (see Figure 1). Based on this analysis no recommendation will be made. The exceedances of nitrite + nitrate in well 803 was too infrequent for evaluation.

Chloride was observed in the piezometer 804 sporadically, a trend could not be established, and the magnitude of the exceedances were not significant.

Ammonia was observed in the piezometer 804. The exceedances appear to have started in late 2019. Given these are the only exceedances there is reasonable doubt that the source of the ammonia is this facility. Previous to this time ammonia was not observed in the shallower groundwater samples. The department will continue to monitor the ammonia trends.

Groundwater samples were collected and analyzed for total phosphorus in 2018 and 2019. The results ranged from 0.03 to 0.07 mg/l. Given the distance to the Mississippi River and the concentrations of phosphorus it is likely the concentration would not cause an exceedance of a surface water limit. The monitored groundwater exceedances trend summary is as follows:

MW-2 (802)

Nitrogen, Nitrite + Nitrate
0 of 22 samples exceeded the ES
17 of 22 samples exceeded the PAL
maximum: 7.1 mg/l minimum: 1.3 mg/l average: 4.0 mg/l

MW-3 (803)

Nitrogen, Nitrite + Nitrate
0 of 21 samples exceeded the ES
2 of 21 samples exceeded the PAL
maximum: 2.5 mg/l minimum: 0.3 mg/l average: 1.7 mg/l

PZ-1 (804)

Chloride
0 of 21 samples exceeded the ES
3 of 21 samples exceeded the PAL
maximum: 172mg/l minimum: 65 mg/l average: 124 mg/l

Ammonia
0 of 21 samples exceeded the ES
8 of 21 samples exceeded the PAL
maximum: 2.53 mg/l minimum: 0.14 mg/l average: 0.87 mg/l

Concentrations and trends in the groundwater monitoring data were compared to the loading data for the land disposal system. There were no correlations between the effluent loading levels and the groundwater monitoring results.

Proposed Groundwater Monitoring Requirements

The groundwater sampling frequency and sampling parameters are in the following tables. Several PALs have been modified. No changes will be suggested as to the designation of a well to be sampled as ch. NR140.22 Wis. Admin. Code Point of Standard Application well.

Table 7 Well Sampling Recommendations

Well Name	Sample Point	Sample Frequency	Sample Parameters	Well Designation
801	MW-1	Quarterly	Table 8	Background
802	MW-2	Quarterly	Table 8	Non-Point of Standard
803	MW-3	Quarterly	Table 8	Non-Point of Standard
804	PZ-1	Quarterly	Table 8	Non-Point of Standard

Table 8 Proposed Groundwater Standards –Permit WI-00602224-09

Parameter	PAL	ES	Source
Depth to Groundwater	N/A	N/A	Measured
Groundwater Elevation	N/A	N/A	Measured
Nitrogen, Nitrite + Nitrate	2.4 mg/l (ACL)	10.0 mg/l	Table 1, NR140
Nitrogen, Ammonia	1.2 mg/l (ACL)	9.7 mg/l	Table 1, NR 140
Nitrogen, Organic	2.5 mg/l	N/A	Calculated
Chloride	*145 mg/l (ACL)	250 mg/l	Table 2, NR 140
pH	*6.0-8.0 su	N/A	Calculated
Total Dissolved Solids	550 mg/l	N/A	Calculated

* Recommended changes from previous permit

The reduction of the ACL for chloride and the increase in the PAL for pH are recommended due to changes in the background groundwater quality. It has been recommended that phosphorus sampling be discontinued for permit compliance.

Conclusions

The groundwater monitoring wells appear to be adequately located to determine compliance.

This facility has been determined to be a short flow path to surface water. The parameters and groundwater sampling frequency are adequate to determine compliance.

Only PALs were exceeded during the past permit term and all of these were in groundwater monitoring wells not designated as point of standards application wells (inside the DMZ). Therefore, there is no requirement for chs. NR 140.24 or NR140.26 Wis. Adm. Code response actions.

Overall, the facility is found to be substantially compliant.

Compliance Schedule Recommendations

It appears the last time the top of casing (TOC) elevation was surveyed for the groundwater monitoring wells was in 1996. The TOC elevation should be verified and if not correct a new survey should be conducted.

Figure 1
Nitrite + Nitrate